*International Research Journal of Innovations in Engineering and Technology (IRJIET)*

**ISSN (online): 2581-3048**

**Volume 7, Special Issue of ICRTET-2023, pp 140-141, June-2023**

International Conference of Recent Trends in Engineering & Technology (ICRTET-2023)

# YOLOv4-Based Object Recognition Algorithm for Traffic Monitoring

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***Abstract*** **- Intelligent transportation systems currently require reliable, real-time vehicle detection from visual and audio data for traffic monitoring, and these activities have become crucial in recent years. Machine learning is one of the most important technologies to address this issue since it allows for the perception of information about the environment around the vehicle, which is vital for safe driving. In this study we have implemented the upgraded YOLOv4 video stream object detection algorithm in combination with virtual detector, blob tracking to analyse the video footage of the traffic flow recorded by a camera. Also, we have applied Open CV Computer Vision library to detect objects from the image, track, count and classify the moving vehicles.**

***Keywords:*** YOLOv4, Vehicle detection, Open CV, Machine Le.

## 1. Introduction

**What is vehicle detection?**

The main goal of Vehicle detection and counting in traffic video projects is to develop and implement methodology for automatic detection and counting of moving vehicles on highways. Intelligent visual surveillance (IVS) for road vehicles is a key feature to intelligent transportation systems (ITS). Segmentation with initial background subtraction method is used to detect and count vehicles and same method using morphological operators to determine salient regions in surveillance video sequential frames. Edges are being counted to show how many areas of particular size which have particular vehicles like car locate the points and count the vehicles in the traffic domain and monitoring over it on highways.

## 2. Related Theories

In YOLO for object detection, OPENCV, Coco Dataset, SORT.PY are the methodology used to detect and count the vehicles. The proposed system involves a Convolutional neural network which is a type of artificial neural network. The system is used to detect, recognize and t rack the vehicles in the sequence of video frames, after that classification of vehicles is done which are detected in accordance with their size in different classes. YOLO with convolutional neural network (CNN) for detecting moving objects in real-time and object tracking with OpenCV.

## 3. Software Requirement & Document Specification

This project involves various system requirements to be included to successfully implement the project. The requirements are specified in the description below.

**System Requirements**

**A) Minimum Hardware Requirements:**

a) Laptop/Computer/Monitor

**B) Software Requirements:**

a) Python-3.x(We used python 3.8.8 in this project)
b) OpenCV-4.4.0
c) Numpy-1.20.3
d) YOLOV3

**C) Programming languages**

a) Python

## 4. YOLO Object Detection

Object detection is a difficult task which involves rising upon methods for object recognition, objects localization, and object classification. The "You Only Look Once," is a group

 

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of Convolutional Neural Networks which accomplish approx. Results with a start to finish model which performs object recognition progressively. There are three fundamental modifications of this methodology; they are YOLOv1, YOLOv2, and YOLOv3. The primary form proposed the basic architecture, and the subsequent form filtered the plan and shaped the utilization of predetermined anchor boxes for improving the bounding box proposal, and version three additionally filtered the model engineering and preparing process.

**OpenCV**

OpenCV is the main open source library for computer vision, image handling and AI, and now includes GPU acceleration for synchronal operation. Open CV supports a lot of algorithms related to PC Vision and AI and it is extending step - by-step. Open CV was intended for computational productivity and with a immersed focus on real-time applications. Open CV- python supports libraries like NumPy, utilis, etc. and also gives MATLAB- style index.

## 5. Conclusion

A system has been developed to detect and count dynamic and efficient vehicles on highways, streets and heavily congested lanes. The system has effective work and knowledge about vehicle count and classification with time domain and to identify the particular vehicles in the presence of any traffic areas and in some of the heavy congested roads, the background is effectively rejected. The experimental results shown have the accuracy of counting vehicles was in range 70% - 96%. At long last, we planned a vehicle counting and classification model, which can precisely count the vehicles with the base algorithm as YOLO trained on COCO dataset. We have used the object label to take objects that are labelled as vehicles, which include cars, motorbikes, trucks, bicycles and other heavy vehicles. The proposed system demonstrates that vehicle counting and classification model for roadways can get over 93% exactness and 25 FPS speed on vehicle detection, counting and classification of tracked vehicles.

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**Citation of this Article:**

Dr. Khushbu Rahangdale, Gauri Dongare, Kalyani Bhutte, Shivani Nanekar, Audumber kedari, “YOLOv4-Based Object Recognition Algorithm for Traffic Monitoring” in proceeding of International Conference of Recent Trends in Engineering & Technology ICRTET - 2023, Organized by SCOE, Sudumbare, Pune, India, Published in IRJIET, Volume 7, Special issue of ICRTET-2023, pp 140-141, June 2023.

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